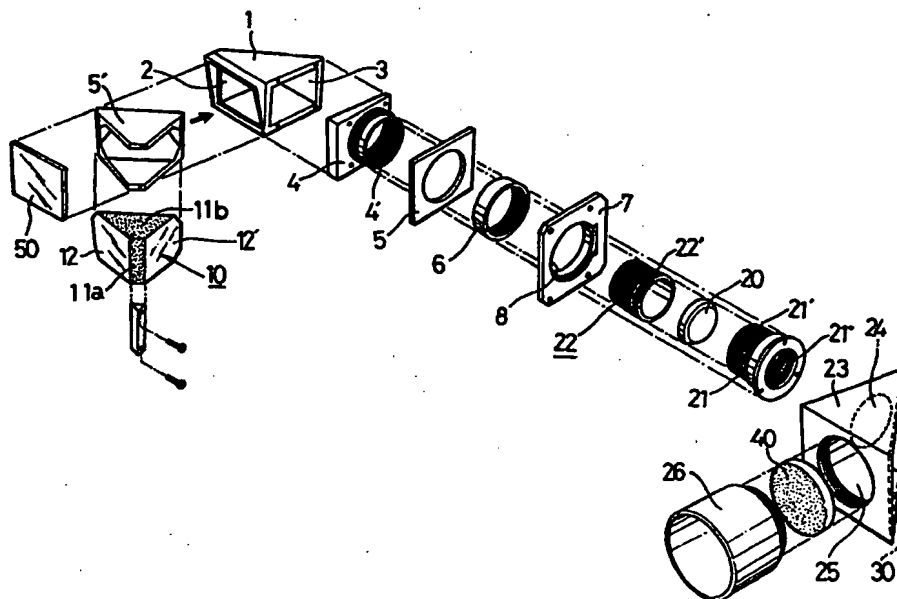




INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification ⁶: B60R 1/08	A1	(11) International Publication Number: WO 95/32103 (43) International Publication Date: 30 November 1995 (30.11.95)
(21) International Application Number: PCT/KR95/00057 (22) International Filing Date: 19 May 1995 (19.05.95) (30) Priority Data: 1994/11093 20 May 1994 (20.05.94) KR 1995/12479 19 May 1995 (19.05.95) KR (71)(72) Applicant and Inventor: NAM, Joong, Kwon [KR/KR]; 154-2, Youngdeok-Ri, Kihung-Eub, Yongin-Goon, Kyongki-Do 449-900 (KR). (74) Agent: KIM, Sung, Ki; Daechang Building, 201Ho, 827-66, Yeoksam-dong, Kangnam-ku, Seoul 135-784 (KR).		(81) Designated States: AM, AT, AU, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, JP, KE, KG, KP, KZ, LK, LR, LT, LU, LV, MD, MG, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SI, SK, TJ, TT, UA, US, UZ, VN, European patent (AT, BE, CH, DE, DK, ES, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG), ARIPO patent (KE, MW, SD, SZ, UG). Published <i>With international search report.</i>

(54) Title: OPTIC REARVIEW MIRROR**(57) Abstract**

An optic rearview mirror is disclosed. The rearview mirror uses a frusto right prism (10) and a pair of convex lenses (20, 40) having flat sides and enlarges the rearview angle and removes the dead angle and allows the driver to see about the rear bumper and thereby preventing possible accident during reversing an automobile and providing the fine rearview for the driver even in bad weather, such as in a snow day or a rain day. The rearview mirror also uses light shielding (26) and scattering means in front of a screen surface (41) of a screen lens (40) having a flat side. When rotating the means, the brightness of the image focused on the mirror is improved and thereby providing high quality image for the driver.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AT	Austria	GB	United Kingdom	MR	Mauritania
AU	Australia	GE	Georgia	MW	Malawi
BB	Barbados	GN	Guinea	NE	Niger
BE	Belgium	GR	Greece	NL	Netherlands
BF	Burkina Faso	HU	Hungary	NO	Norway
BG	Bulgaria	IE	Ireland	NZ	New Zealand
BJ	Benin	IT	Italy	PL	Poland
BR	Brazil	JP	Japan	PT	Portugal
BY	Belarus	KE	Kenya	RO	Romania
CA	Canada	KG	Kyrgyzstan	RU	Russian Federation
CF	Central African Republic	KP	Democratic People's Republic of Korea	SD	Sudan
CG	Congo	KR	Republic of Korea	SE	Sweden
CH	Switzerland	KZ	Kazakhstan	SI	Slovenia
CI	Côte d'Ivoire	LI	Liechtenstein	SK	Slovakia
CM	Cameroon	LK	Sri Lanka	SN	Senegal
CN	China	LU	Luxembourg	TD	Chad
CS	Czechoslovakia	LV	Latvia	TG	Togo
CZ	Czech Republic	MC	Monaco	TJ	Tajikistan
DE	Germany	MD	Republic of Moldova	TT	Trinidad and Tobago
DK	Denmark	MG	Madagascar	UA	Ukraine
ES	Spain	ML	Mali	US	United States of America
FI	Finland	MN	Mongolia	UZ	Uzbekistan
FR	France			VN	Viet Nam
GA	Gabon				

OPTIC REARVIEW MIRROR

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates in general to an optic rearview mirror, comprising a prism and a convex lens, for seeing out of the back window of automobile and, more particularly, to an optic rearview mirror not only enlarging the sideview angle due to optical effect, such as refraction and inversion, of a frusto right prism but also letting the driver in the cabin simultaneously see the side-rearview and the direct-rearview regardless of weather condition.

Description of the Prior Art

As well known to those skilled in the art, drive mirrors of automobile include two sideview mirrors and a room mirror. The sideview mirrors are mounted to opposed sides of a car body and adapted for observation of sideview, while the room mirror is mounted to the inside front top of the cabin and adapted for observation of direct-rearview. With the sideview mirrors and the room mirror, the driver can safely drive the automobile while seeing the sideview mirrors and the room mirror and thereby preventing possible traffic accident.

However, as a typical sideview mirror merely allows

a sideview angle of about 20° when the mirror is set to the line of driver's vision, there is a dead angle which is out of the line of driver's vision and this may cause traffic accident. When operating air conditioner or heater in the automobile, the windows steam up due to temperature difference between the inside and the outside of cabin and this disturbs the driver from seeing out the windows. In particular, steaming up of windows becomes worse in bad weather, such as a snow day or a rain day, so that the windows in the bad weather should be opened when seeing the mirrors.

In a snow day or a rain day, the back window is steamed up so that it is impossible to discriminate things except for light out of the back window. In this case, the driver can not help reversing the automobile with estimation and can not protect the automobile from another automobile in back. Furthermore, the typical rearview mirror can not allow the driver to see about the rear bumper of the automobile and thereby possibly causing an accident when reversing the automobile even in a fine day.

The typical sideview mirrors are designed to be adjusted in their angles to the top, bottom, right or left by the driver in the cabin so that the angles of sideview mirrors may be changed even by slight impact caused, for example, when closing the doors. This makes the driver repeatedly adjust the angle of the mirror to keep the desired view angle.

In an effort to reduce the dead angle of the sideview mirror, a convex lens may be mounted to the sideview mirror or an additional mirror may be mounted to an appropriate position of the car body. However, neither
5 the convex lens nor the additional mirror can remove the problem of observation impossibility caused by bad weather. In addition, there have been several proposals for overcoming the above problems by use of a magnifying lens or a reflection mirror. However, as both the
10 magnifying lens and the reflection mirror not only invert the image but also have abnormal refraction index so that use of either the magnifying lens or the reflection mirror is accompanied with excessive length of body tube or with excessive size of the sideview mirror. Therefore, use of
15 either the magnifying lens or the reflection mirror not only causes inferior practicality but also increases the cost.

SUMMARY OF THE INVENTION

It is, therefore, an object of the present invention
20 to provide an optic rearview mirror in which the above problems can be overcome and which uses a frusto right prism and a pair of convex lenses having flat sides and enlarges the rearview angle and removes the dead angle and allows the driver to see about the rear bumper and thereby
25 preventing possible accident during reversing an

automobile and providing the fine rearview for the driver even in bad weather, such as in a snow day or a rain day.

It is another object of the present invention to provide an optic rearview mirror which uses light
5 shielding and scattering means in front of a screen surface of a screen lens having a flat side and rotating the means and thereby improving the brightness of the image focused on the mirror and providing high quality image for the driver.

10 In order to accomplish the above object, the present invention provides an optic rearview mirror using a frusto right prism adapted for overcoming abnormal refractive index, image inversion and image separation caused by use of optical elements. In an embodiment, the optic rearview
15 mirror includes a frusto right prism for inverting rearview image or side-rearview image in every directions, an image magnifying lens for reinverting the image inverted by the frusto right prism, and an inversion mirror for converting the angle of image reinverted by the
20 image magnifying lens into an angle suitable for observed by the driver. The optic rearview mirror also includes a screen lens for showing the image projected by the inversion mirror, and means for shielding and scattering the light and improving the brightness of the image
25 focused on the screen lens and providing high quality of image. In another embodiment, the optic rearview mirror does not use the inversion mirror but uses a pair of right

prisms which are arranged between the frusto right prism and the image magnifying lens and adapted for transmitting the image from the frusto right prism to the screen lens without changing view angle. In the optic rearview mirror of this invention, the optical elements, that is, the frusto right prism, the image amplifying lens, the inversion mirror, the pair of right prisms, the screen lens and the light shielding and scattering means, are set in a sealed housing and mounted to a car body.

10 BRIEF DESCRIPTION OF THE DRAWINGS

The above and other objects, features and other advantages of the present invention will be more clearly understood from the following detailed description taken in conjunction with the accompanying drawings, in which:

15 Fig. 1 is an exploded perspective view of an optic rearview mirror in accordance with a primary embodiment of the present invention;

Fig. 2 is a sectional view of the assembled rearview mirror of Fig. 1;

20 Fig. 3 is a perspective view of a frusto right prism of the rearview mirror of Fig. 1;

Fig. 4 is a perspective view of a screen lens of the rearview mirror of Fig. 1;

25 Fig. 5 is a plan view of the assembled rearview mirror of the invention, showing an image refraction of

the rearview mirror when using the rearview mirror as a driver seat sideview mirror;

Fig. 6 is a front view of the rearview mirror of Fig. 5;

5 Fig. 7 is a plan view of the assembled rearview mirror of the invention, showing an image refraction and a field of view of a semi-transparent glass when using the rearview mirror as a driver seat sideview mirror;

10 Fig. 8 is a perspective view of a mirror assembly, yielding the same effect as that of the frusto right prism, in accordance with a second embodiment of the present invention;

15 Fig. 9 is a plan view of a mirror and prism assembly, used as a driver seat sideview mirror, in accordance with a third embodiment of the present invention;

Fig. 10 is a front view of the mirror and prism assembly of Fig. 9;

20 Fig. 11 is a plan view of a mirror and prism assembly, used as a driver seat sideview mirror, in accordance with a fourth embodiment of the present invention;

Fig. 12 is a front view of the mirror and prism assembly of Fig. 11;

25 Fig. 13 is a plan view of an optical assembly, used as an assistant driver seat sideview mirror, in accordance with a fifth embodiment of the invention, showing image refraction of the optical assembly;

Fig. 14 is a front view of the optical assembly of Fig. 13;

Fig. 15 is a plan view of an optical assembly, used as an assistant driver seat sideview mirror, in accordance
5 with a sixth embodiment of the invention;

Fig. 16 is a front view of the optical assembly of Fig. 15;

Fig. 17 is an exploded perspective view of a screen lens, provided with a pair of symmetric prisms for
10 discriminating the distance from a real thing in back, of the invention;

Fig. 18 is a front view of the screen lens of Fig. 18;

Fig. 19 is a sectional view of the screen lens of
15 Fig. 18;

Figs. 20 to 23 are sectional view of different embodiments of light shielding and scattering means used in the optic rearview mirror of the invention respectively, the means being used for improving the
20 quality of image focused on the screen lens and thereby producing high quality of image;

Fig. 25 is a plan view showing side-rearview angles of the rearview mirrors of the invention;

Figs. 26 to 27 are side views, showing rearview
25 angles of the rearview mirrors of the invention; and

Fig. 28 is a side view, showing observation of direct-rearview using the rearview mirror of the present

invention.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 is an exploded perspective view of an optic rearview mirror in accordance with a primary embodiment of the present invention and Fig. 2 is a sectional view of the assembled rearview mirror of Fig. 1.

As shown in the drawings, the rearview mirror includes a frustum of right prism or a frusto right prism 10, which inverts the side-rearview image and the direct-rearview image, and an image magnifying lens 20 which turns over the inverted images of the prism 10. The mirror also includes an inversion mirror 30 for changing the angle of image of the lens 20 into an angle suitable for observed by the driver. The mirror further includes a screen lens 40 for producing the image projected by the inversion mirror 30 and thereby showing the image.

When setting the prism 10, the lens 20, the mirror 30 and the screen lens 40 in a sealed housing, the prism 10 received in a protection cover 5' is set in a trigonal outer casing 1. The outer casing 1 is provided with a light incident part 2 in a side and a light projecting part 3 in another side. The light incident part 2 includes a semi-transparent mirror 50, while the light projecting part 3 is provided with a connection flange 4.

The rearview mirror also has a trigonal casing or an

inner body tube 23. A side wall of the trigonal tube 23 is provided with a light incident part 24 which will be coupled to an image magnifying lens mount flange 21, while another side wall of the trigonal tube 23 is provided with
5 a screen lens mount part 25 which will be coupled to a screen lens mount wheel 26. The screen lens 40 is set in the wheel 26. The inversion mirror 30 is mounted to an interior wall of the trigonal tube 23.

The connection flange 4 is mounted to the light
10 projecting part 3 of the casing 1. A holed rectangular plate 5 is fitted over a bush of the flange 4 prior to tight engagement of a connection nut 6 with an outer-threaded part 4" of the bush of the flange 4. The plate 5 is fixed in its position on the flange 4. The image
15 magnifying lens 20 is set in the lens mount flange 21. Thereafter, an outer-threaded fixing pipe 22 is coupled to the lens mount flange 21 by engaging an outer-threaded part 22' of the pipe 22 with an inner-threaded part 21" of the flange 21 and thereby fixing the lens 20 in its
20 position in the flange 21. The lens mount flange 21 having the lens 20 is, thereafter, fitted into a center opening 8 of a coupling plate 7. The plate 7 in turn is coupled to the light incident part 24 of the trigonal tube 23 and thereby mounting the flange 21 to the tube 23.
25 Thereafter, an inner-threaded part 4' of the flange 4 engages with the outer-threaded part 21' of the flange 21.

In the above optic rearview mirror, the contact parts

between the right prism 10, the image magnifying lens 20, the inversion mirror 30 and the screen lens 40 in the sealed housing should be hermetically sealed. Such hermetical sealing of the contact parts is for prevention
5 of incidence of noise light except for incidence of light through the semi-transparent mirror 50, the light incident part 2 of the casing 1 and a light projecting surface 12 of the prism 10.

In order to keep the hermetical sealing of the
10 contact parts, packings may be provided for contact parts between the elements of the sealed housing.

In order to overcome the top, bottom, right and left inverting action of the image magnifying lens 20 used for clearly producing the image on the screen, the reflection
15 part of the prism 10 is provided with slope surfaces 14 and 14' and thereby making a right angle as shown in Fig. 3 and inverting the image to the top, bottom, right and left at the same time.

The image passes through the prism 10 practically
20 inverting the image to the top, bottom, right and left at the same time and in turn passes through the image magnifying lens 20, thus to be observed by the driver. The image amplified and inverted by the lens 20 in turn is projected by the screen lens 40, the screen lens 40
25 being arranged such that it makes $90^\circ - 60^\circ$ angle with the image magnifying lens 20 and thereby facilitating image observation.

The prism 10 which is the most important element of the rearview mirror of this invention has opaque cutting surfaces 11a, 11b, 11c, 11d and 11e on its front, top, left-side, right-side and bottom surfaces as shown in Fig.

5 3. The prism 10 also includes a pair of transparent surfaces 12 and 12' on opposed sides of the front cutting surface 11a. The transparent surfaces 12 and 12' make a right angle with each other.

The back surfaces of the front cutting surface 11a and of the transparent surfaces 12 and 12' are provided
10 with slope surfaces 14 and 14', each slope surface 14 or 14' being provided with a 90° reflection angle 13 and coated with aluminum. The slope surfaces 14 and 14' not only improve the light reflection efficiency of the prism
15 10 but also invert the image to the top and bottom. Therefore, the specially shaped prism 10 of this invention generates the top and bottom inversion due to the slope surfaces 14 and 14' as well as the right and left inversion basically expected by a typical right prism.
20 Therefore, the prism 10 achieves reinversion of the image of the image magnifying lens 20 and thereby overcoming the operational limit of the body tube and the limit of image angle.

In the above optic rearview mirror, use of the screen
25 lens 40 is for prevention of fatigue of driver's eyes and image scattering of the lens. That is, as the screen lens 40 has a screen surface, the lens 40 not only prevents

possible fatigue of driver's eyes possibly generated in use of typical lens but also prevents possible image scattering of the lens generated when changing the line of driver's vision. Otherwise stated, the screen lens 40 makes the driver free from eye fatigue regardless of long time observation and prevents image scattering of the lens even when the line of driver's vision is changed.

The screen lens 40 uses a convex lens having a flat side 41 as shown in Fig. 4. The flat side 41 of the convex lens is subjected to a screen treatment using hydrofluoric acid and thereby making the side 41 semi-transparent.

When the prism 10, the image magnifying lens 20, the inversion lens 30 and the screen lens 40 are arranged as shown in Figs. 5 and 6, each of the left and right lines A and C makes an angle of about 40° with the line B of driver's vision so that the rearview mirror of this invention facilitates observation of the rearview. Of course, it should be understood that the rearview angle may be enlarged than 40° . However, the angle of 40° is noted to be most profitable when regarding size difference between the image and the real thing.

As the rearview angle of about 40° of the prism 10 is defined by the refraction angle of the image magnifying lens 20, the rearview angle may be enlarged by use of an image magnifying lens having larger refraction angle.

It is impossible to use a typical mirror or a typical

prism in the optic rearview mirror as there is a limit in image inversion of either the typical mirror or the typical prism. However, the optic rearview mirror of this invention uses the specially shaped prism 10, which
5 inverts the image in every directions, and reinverts the image of the prism 10 by the image magnifying lens 20. Therefore, the image which is reflected by the inversion mirror 30 and focused on the screen lens 40 is equal to the image focused on a typical rearview mirror. The optic
10 rearview mirror of this invention lets the driver see out of the back window through the screen lens 40 inside of the cabin of automobile.

As shown in Fig. 7, the right incident part 2 of the outer casing 1 connected to the light projecting surface
15 12 of the prism 10 is provided with the semi-transparent mirror 50 which transmits 60 - 80 % of the incident light. The semi-transparent mirror 50 not only protects the prism 10 from the outside but also lets the prism 10 provide direct-rearview angle of about 40°. The light, which does
20 not pass through the mirror 50 but is reflected by the mirror 50, provides side-rearview angle of 60° so that the mirror 50 acts as an auxiliary sideview mirror.

The semi-transparent mirror 50 may be produced by combining a reflection glass with a transparent glass.
25 The transparent glass of the mirror 50 has an area equal to the light incident area of the prism 10 such that all of the light, after passing the transparent glass, can be

transmitted to the rearview mirror of this invention. On the other hand, the reflection glass of the mirror 50 is arranged in the outside of the transparent glass and thereby acting as a typical rearview mirror.

5 The top of the casing 1 having the semi-transparent mirror 50 is provided with a hood of 3 - 5 cm width. The hood protects the mirror 50 from rain or snow and thereby preventing possible obstacle in observation of rearview.

Turning to Fig. 8, there is shown a mirror assembly,
10 functioning as the prism 10, in accordance with a second embodiment of the present invention. In the second embodiment, a top slope mirror 81 and a bottom slope mirror 82 are bonded to each other at a right angle and thereby forming a reflection mirror 80 yielding the same
15 operational effect as that of the prism 10 of the primary embodiment. The top and bottom slope mirrors 81 and 82 of the reflection mirror 80 function as the slope surfaces 14 and 14' of the prism 10 respectively. The second embodiment thus achieves the functional effect of the
20 slope surfaces 14 and 14' of the prism 10 with low cost.

Referring next to Figs. 9 and 10, there is shown a mirror and prism assembly used as a driver seat sideview mirror in accordance with a third embodiment of the present invention. The assembly of the third embodiment
25 includes a flat reflection mirror 83 and a pair of right prisms 84 and 85 bonded to each other. The flat reflection mirror 83 and the bonded right prisms 84 and

85 invert the image in every directions in the same manner as described for the prism 10 so that the assembly of the third embodiment can be used as a sideview mirror to be installed in the driver seat.

5 With reference to Figs. 11 and 12, there is shown a mirror and prism assembly used as a driver seat sideview mirror in accordance with a fourth embodiment of the present invention. The assembly of the fourth embodiment includes a flat reflection mirror 83 and a trapezoidal
10 prism 86 which yield the same effect of the assembly of Figs. 9 and 10. Therefore, the assembly of the fourth embodiment can be used as a sideview mirror to be installed in the driver seat.

 Figs. 13 and 14 show an optical assembly used as an
15 assistant driver seat sideview mirror in accordance with a fifth embodiment of the invention. In this embodiment, the image magnifying lens 20 and the screen lens 40 are arranged on a concentric axis without use of inversion mirror 30. In addition, a pair of right prisms 84 and 85
20 which are bonded to each other are arranged between the prism 10 and the image magnifying lens 20. In this optical assembly, only the top and bottom images of the top, bottom, right and left images which were inverted by the prism 10 are reinverted so that this optical assembly
25 can be used as a sideview mirror to be installed in the assistant driver seat.

 Turning to Figs. 15 and 16, there is shown an optical

assembly used as an assistant driver seat sideview mirror in accordance with a sixth embodiment of the invention. In this embodiment, a trapezoidal prism 86 is used instead of the pair of right prisms 84 and 85. This optical
5 assembly can invert the top and bottom images of the top, bottom, right and left images inverted by the prism 10 so that the optical assembly can be used as a sideview mirror to be installed in the assistant driver seat.

In the right prism 10 used in the optical assembly
10 used as the sideview mirror to be installed in the assistant driver seat, the angle of the light projecting surface 12 of the prism 10 may be enlarged to 120° and thereby enlarging the refraction angle of the image projected from the outside. In addition, the reflection
15 mirror 80 which is formed by bonding the top slope mirror 81 to the bottom slope mirror 82 at a right angle may be used instead of the prism 10 in the same manner as described for the above sideview mirror which will be installed in the assistant driver seat.

20 As shown in Figs. 17 to 19, a pair of symmetric prisms or micro prisms 44 and 45 may be installed in the center of the screen lens 40. In addition, slope surfaces 46 and 47 are formed in the symmetric prisms 44 and 45 respectively so that it is possible to accurately
25 discriminate the distance from the real thing in back of the automobile. That is, as the image in the symmetric prisms 44 and 45 is separated to the right and to the left

when the distance from the real thing in back of automobile is longer or shorter than the distance set by the slope surfaces 46 and 47 of the symmetric prisms 44 and 45, it is possible to accurately discriminate the distance from the real thing.

Turning to Figs. 20 to 23, there are shown different embodiments of light shielding and scattering means 70 used in the optic rearview mirror of the invention, the means 70 being used for shielding and scattering the light, after passing the screen lens 40, and thereby producing high quality of image.

In the embodiment of Fig. 20, the means 70 is produced by mounting a great number of small-sized glass balls 72 on a side of a transparent glass 71. When rotatably mounting the glass 71 with the glass balls 72 to the flat side 41 of the screen lens 40 and rotating the glass 71, the light is shielded and scattered by the glass 71 so that the high quality image can be produced. In the embodiment of Fig. 21, the means 70 is produced by forming a great number of concave lenses 73 on a side of a transparent glass 71. When rotatably mounting the glass 71 with the concave lenses 73 to the flat side 41 of the screen lens 40 and rotating the glass 71, the light is shielded and scattered by the glass 71 so that the high quality image can be produced. In the embodiment of Fig. 22, the means is produced by forming a great number of convex lenses 74 on a side of a transparent glass 71.

When rotatably mounting the glass 71 with the convex lenses 74 to the flat side 41 of the screen lens 40 and rotating the glass 71, the light is shielded and scattered by the glass 71 so that the high quality image can be produced. In the embodiment of Fig. 23, the means 70 is produced by forming a great number of concave lenses 73 on a side of a transparent glass 71 and a great number of convex lenses 74 on the other side of the glass 71. When rotatably mounting the glass 71 with both the concave lenses 73 and the convex lenses 74 to the flat side 41 of the glass 71, the light is shielded and scattered by the glass 71 so that the high quality image can be produced. In the embodiment of Fig. 24, the means is produced by mounting a great number of short optical fibers on a side of a transparent glass 71. When rotatably mounting the glass 71 with the optical fibers to the flat side 41 of the screen lens 40 and rotating the glass 71, the light is shielded and scattered by the glass 71 so that the high quality image can be produced.

When rotating the light shielding and scattering means 70 rotatably mounted to the flat side 41 of the screen lens 40, the light, after passing through the screen lens 40, is shielded and scattered by the means 70 so that the brightness of the image focused on the screen is improved and the high quality image can be produced.

The operational effect of the above rearview mirror will be described hereinbelow.

As the semi-transparent mirror 50 is mounted to the light incident part 2 of the outer casing 1 having the frusto right prism 10, the rearview angle of the instant rearview mirror is enlarged to about 20° between the lines d and e in addition of the basic rearview angle of 40° between the lines a, b and c of the prism 10 as shown in Fig. 25. Furthermore, it is possible to provide rearview angle not less than 70° when slightly changing the line of driver's vision so that the rearview mirror of this invention can remarkably reduce the dead angle.

When comparing the instant optic rearview mirror with a typical rearview mirror, each of the side-rearview angles, that is, the angle of the sector X between the lines a and b and the angle of the sector X' between the lines a' and b' of Fig. 25, of typical rearview mirrors mounted to opposed side of a car body is less than 20° so that the sectors Y, Y', Z and Z' remain as dead angle sectors or danger sectors. However, the optic rearview mirror of this invention, using the frusto right prism 10 and the image magnifying lens 20, allows the driver to observe the sectors X, Y and Z between the lines a and c and the sectors X', Y' and Z' between the lines a' and c' and thereby remarkably reduce the dead angle of the rearview mirror. Furthermore, when the optic rearview mirror uses the semi-transparent mirror 50, the rearview mirror also allows the driver to observe the sector a between the lines d and e and the sector a' between the

lines d' and e' and thereby completely removing the dead angle.

When the inverted prisms 10 are installed, as shown in Fig. 28, in the positions r and s of Fig. 26, the sector between the line R and S can be observed by the driver. When installing the optical assembly, free from prisms 84 and 85, of Figs. 13 and 14 on the position t of Fig. 26 or installing the optical assembly, free from the trapezoidal prism 86, of Figs. 15 and 16 on the position u of Fig. 27, the sector between the lines T and U can be observed by the driver. In this case, the driver can safely reverse the automobile.

In accordance with the invention, large area back can be observed by a small-sized optic rearview mirror. When mounting the rearview mirror of this invention to a car body, the outer casing 1 having the prism 10 just projects out of the car body by about 10 - 12 cm. Otherwise stated, a part of the rearview mirror is merely exposed to the outside of the car body such that the size of exposed part of this rearview mirror is a half of that of a typical rearview mirror. Therefore, the rearview mirror of this invention can be prevented from possible damage generated when the automobile runs or is parked on a narrow space.

As described above, the present invention provides an optic rearview mirror including several optical elements. In order to overcome abnormal refractive index,

image inversion and image separation, the rearview mirror of this invention includes a frusto right prism. The image inverted in every directions by the frusto right prism is reinverted by an image magnifying lens. The

5 optic rearview mirror also includes an inversion mirror for converting the angle of image reinverted by the image magnifying lens into an angle suitable for observed by the driver and a screen lens for making clear image projected by the inversion mirror. The above optical elements are

10 set in a sealed housing and thereby not only overcoming irregular and abnormal refractive index but also minimizing the size of rearview mirror. The optic rearview mirror of this invention can be provided with additional function of a sideview mirror by arranging a

15 semi-transparent mirror or combined reflection mirror and transparent glass on the front surface of the frusto right prism. In this case, the optic rearview mirror provides side-rearview angle of about 40 - 60° regardless of exterior conditions such as weather condition so that the

20 rearview mirror reliably allows the driver in the cabin to observe the side-rearview and prevents possible traffic accident caused by dead angle. The optic rearview mirror also may be mounted to the back of the automobile and, in this case, the dead zone in the back of the automobile

25 will be completely removed.

Although the preferred embodiments of the present invention have been disclosed for illustrative purposes,

those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

WHAT IS CLAIMED IS:

1. An optic rearview mirror comprising:

a frusto right prism adapted for inverting an image in every directions;

5 an image magnifying lens adapted for reinverting the image inverted by the frusto right prism;

an inversion mirror adapted for converting angle of the image reinverted by the image magnifying lens into an angle suitable for observed by a driver; and

10 a screen lens adapted for clearly showing the image projected by the inversion mirror.

2. The optic rearview mirror according to claim 1, wherein said frusto right prism is received in a hermetical outer casing; and

15 said inversion mirror is mounted to an interior wall of a trigonal body tube, said body tube being coupled to said screen lens on a side wall thereof and connected to said outer casing through an image magnifying lens mount flange, a fixing pipe, a connection flange and a
20 connection nut.

3. The optic rearview mirror according to claim 1, wherein said frusto right prism has opaque cutting surfaces on its front, top, bottom, right and left surfaces and has a pair of transparent surfaces on opposed

sides of said front opaque cutting surface, the back surfaces of said front cutting surface and of the pair of transparent surfaces being provided with slope surfaces, each of said slope surfaces being provided with a 90° reflection angle and coated with aluminum.

4. The optic rearview mirror according to claim 1, wherein each of said image amplifying lens and said screen lens is produced by oppositely arranging a pair of convex lenses having flat sides.

5. The optic rearview mirror according to claim 1 or 4, wherein a flat side of the screen lens is subjected to a screen treatment using hydrofluoric acid.

6. The optic rearview mirror according to claim 1, wherein a semi-transparent mirror is provided on the front surface of a light projecting part of the frusto right prism so as to use the rearview mirror as a reflection type sideview mirror.

7. The optic rearview mirror according to claim 6, wherein the center of said semi-transparent mirror comprises a transparent glass and the outside of said semi-transparent mirror comprises a reflection glass.

8. The optic rearview mirror according to claim 1 or

3, wherein a pair of reflection mirrors are bonded to each other at right angle and used instead of slope surfaces of said frusto right prism.

9. The optic rearview mirror according to claim 1,
5 further comprising a pair of right prisms and a flat reflection mirror arranged in front of said image magnifying lens.

10. The optic rearview mirror according to claim 1,
10 further comprising a trapezoidal prism and a flat reflection mirror arranged in front of said image magnifying lens.

11. The optic rearview mirror according to claim 1,
further comprising a pair of right prisms arranged between said frusto right prism and said image magnifying lens.

15 12. The optic rearview mirror according to claim 1,
further comprising a trapezoidal prism arranged between said frusto right prism and said image magnifying lens.

13. The optic rearview mirror according to any one
of claims 1, 2, 4 and 5, further comprising a pair of
20 symmetric prisms arranged in the center of said screen lens, said symmetric prisms having slope surfaces respectively and thereby discriminating a distance from

a real thing in back of an automobile.

14. The optic rearview mirror according to any one of claims 1, 2, 4, 5 and 14, wherein a transparent glass provided with a plurality of small-sized glass balls on
5 a side thereof is rotatably mounted to a flat side of said screen lens.

15. The optic rearview mirror according to any one of claims 1, 2, 4, 5 and 14, wherein a transparent glass provided with a plurality of small-sized concave lenses
10 on a side thereof is rotatably mounted to a flat side of said screen lens.

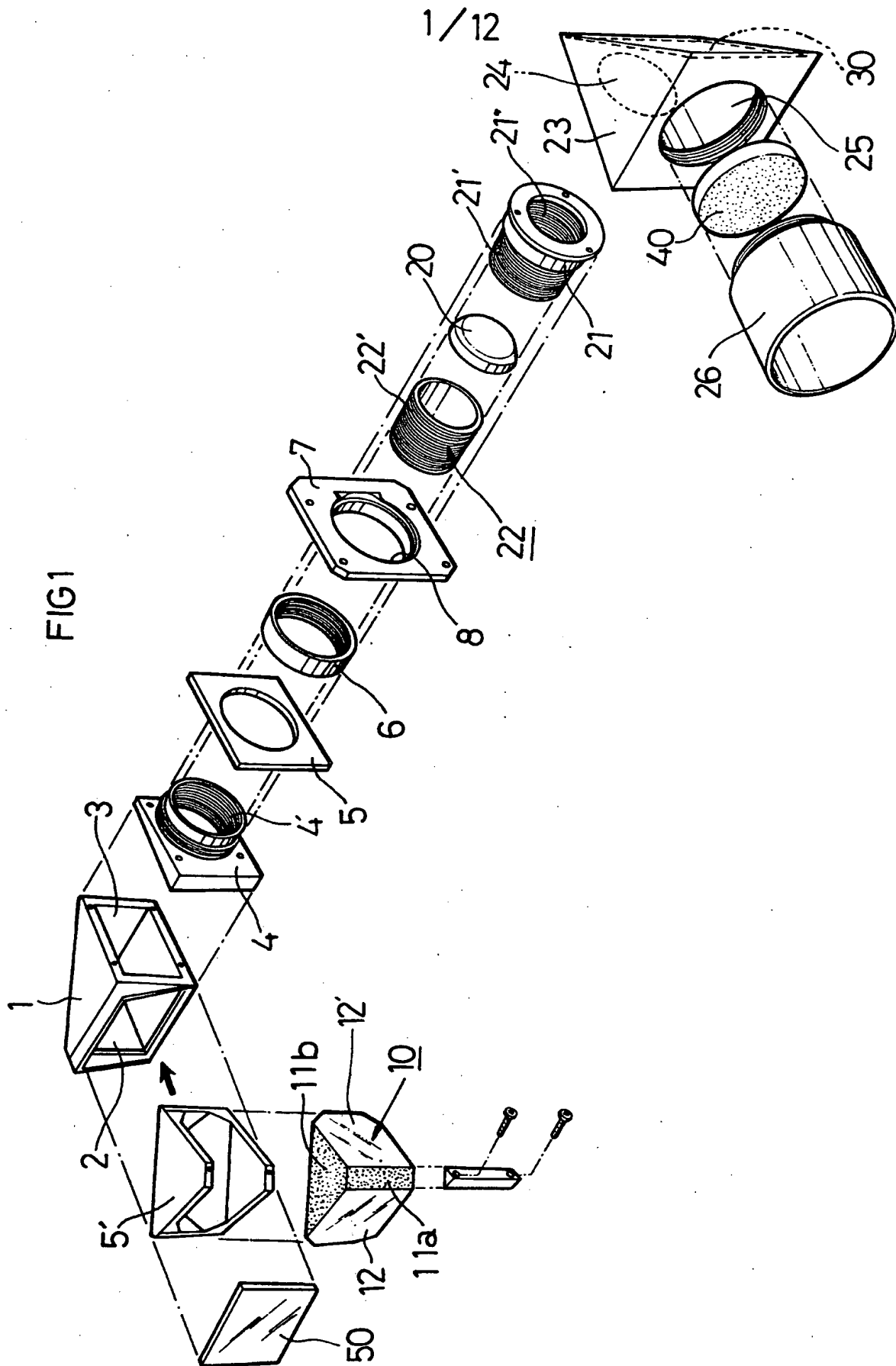
16. The optic rearview mirror according to any one of claims 1, 2, 4, 5 and 14, wherein a transparent glass provided with a plurality of small-sized convex lenses on
15 a side thereof is rotatably mounted to a flat side of said screen lens.

17. The optic rearview mirror according to any one of claims 1, 2, 4, 5 and 14, wherein a transparent glass provided with a plurality of small-sized concave lenses
20 and a plurality of small-sized convex lenses on opposed sides thereof is rotatably mounted to a flat side of said screen lens.

18. The optic rearview mirror according to any one of claims 1, 2, 4, 5 and 14, wherein a transparent glass provided with a plurality of short optical fibers on a side thereof is rotatably mounted to a flat side of said screen lens.

19. The optic rearview mirror according to claim 1 or 2, wherein said frusto right prism is turned up at 180° angle so as to use the rearview mirror in observation of direct rearview.

10 20. The optic rearview mirror according to claim 11 or 12, wherein said right prisms and said trapezoidal prism are removed from between said frusto right prism and said image magnifying lens so as to use the rearview mirror in observation of direct rearview.



2/12

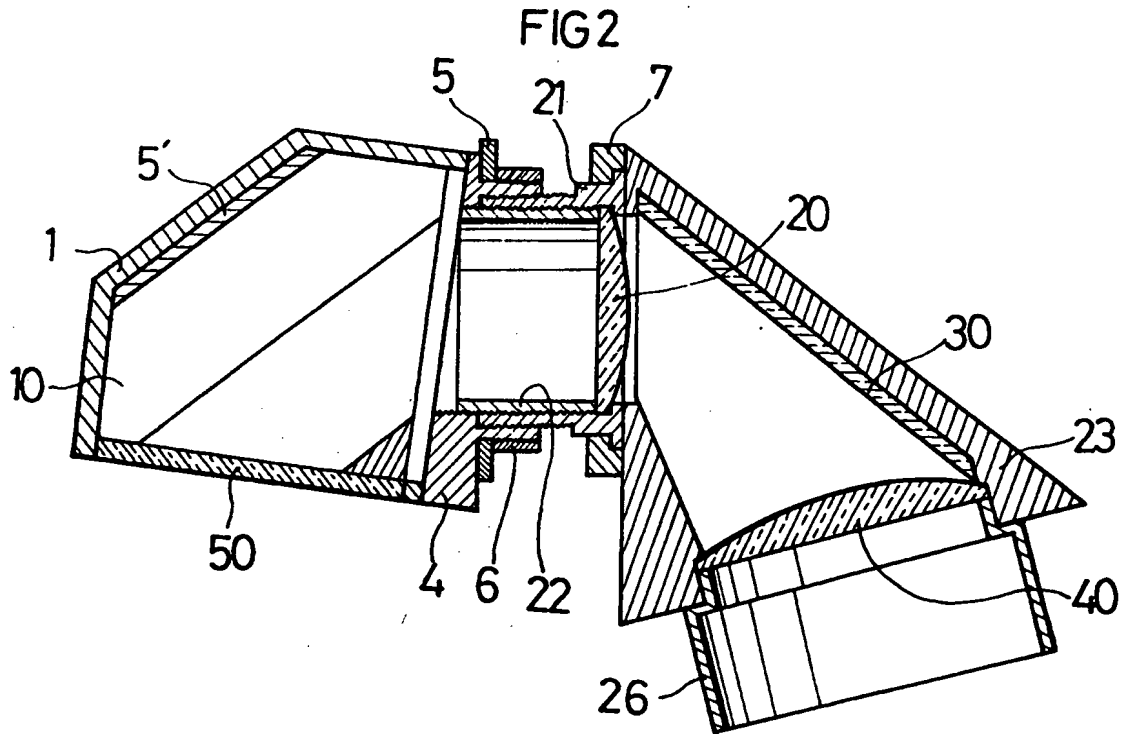


FIG 3

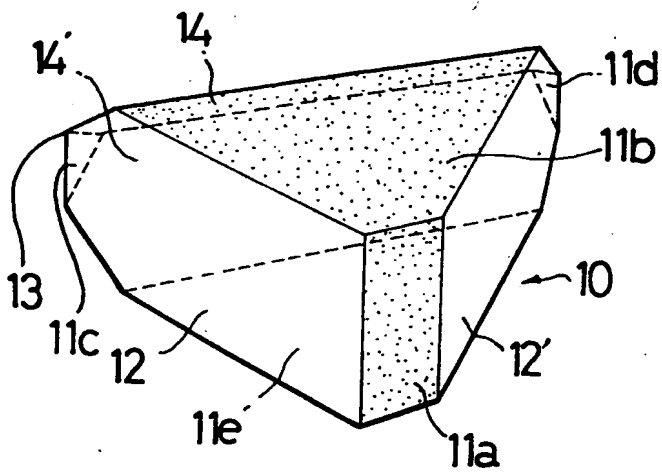
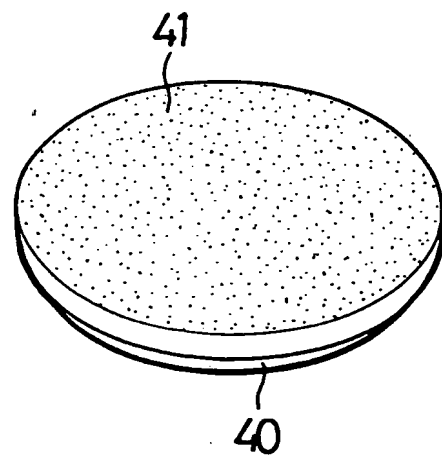


FIG 4



3/12

FIG 5

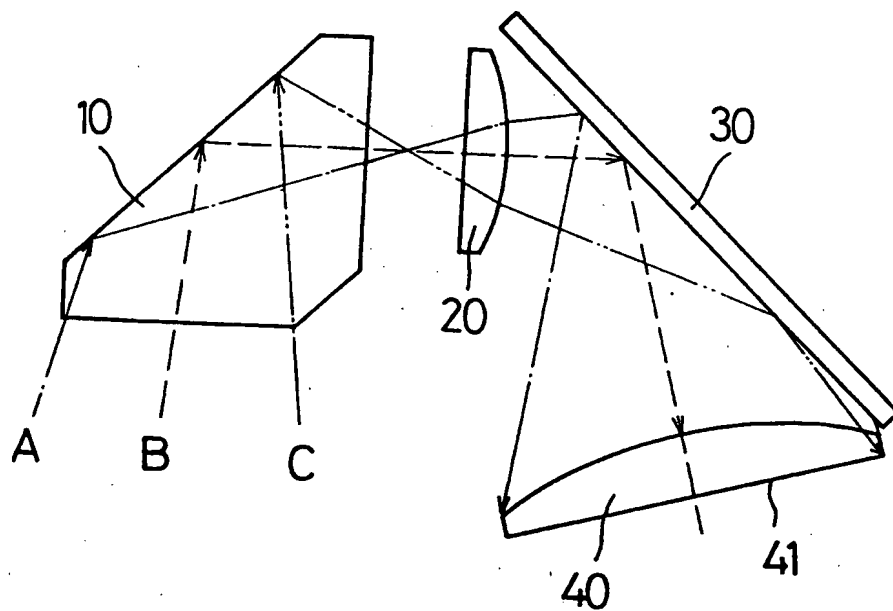
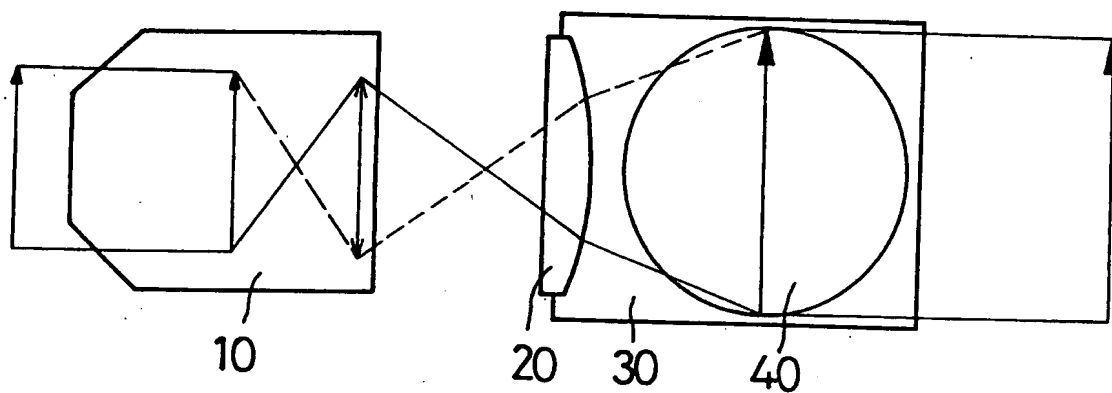


FIG6



4/12

FIG 7

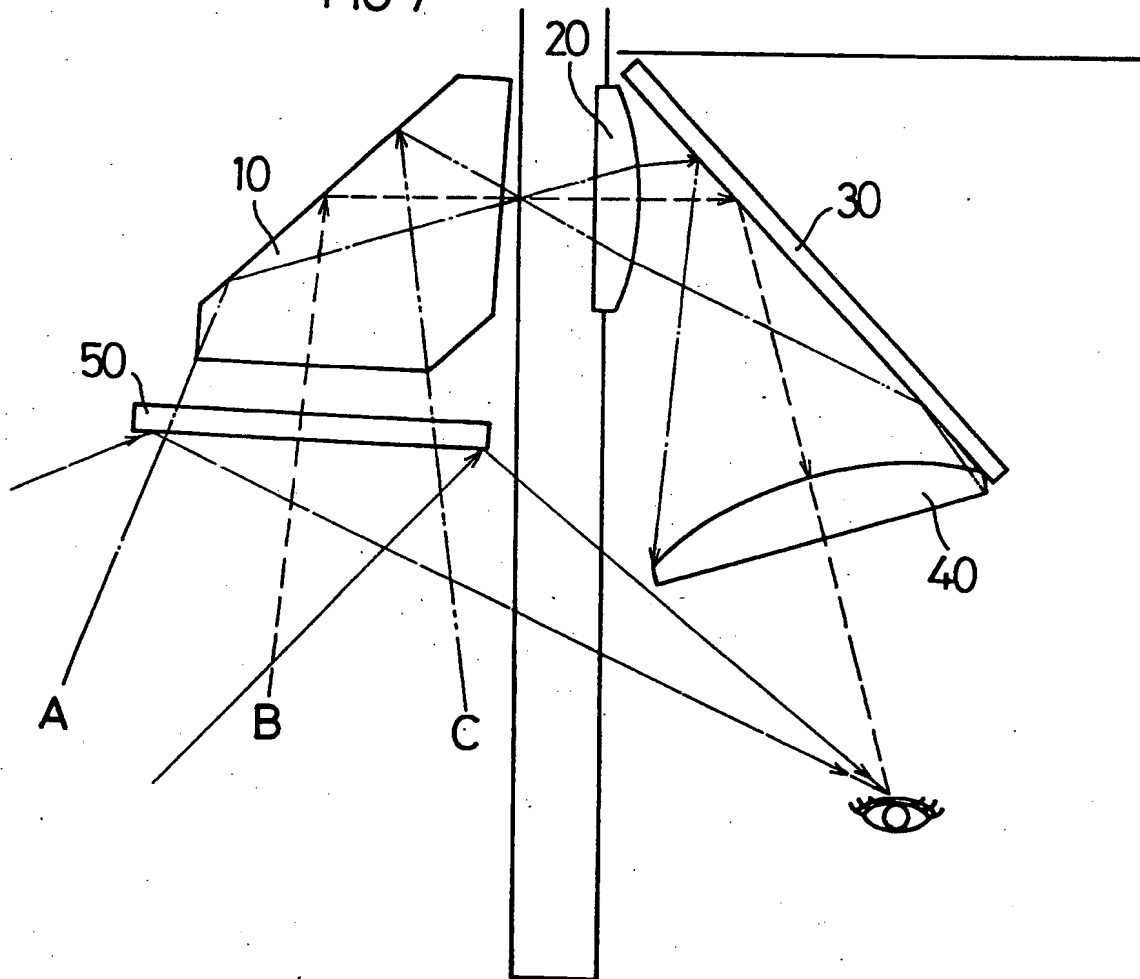
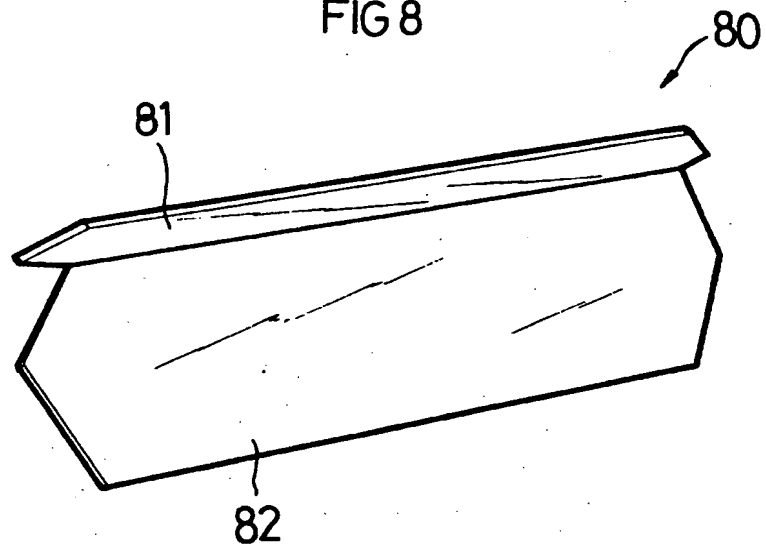


FIG 8



5/12

FIG 9

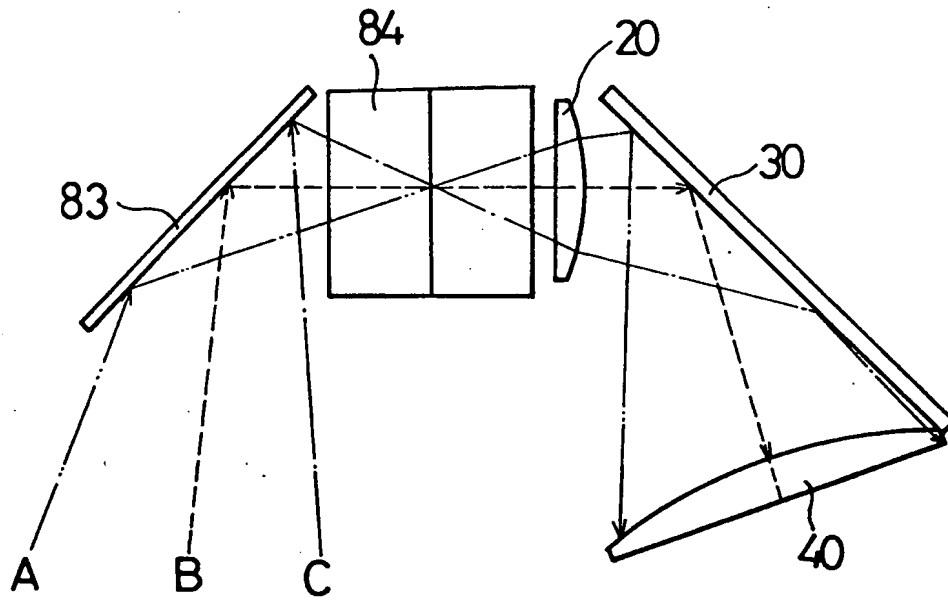
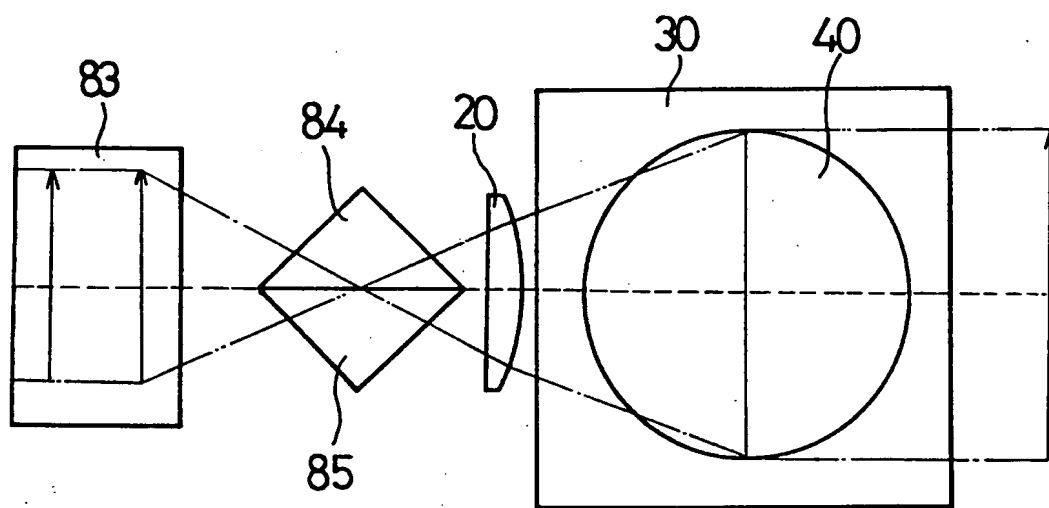


FIG 10



6/12

FIG 11

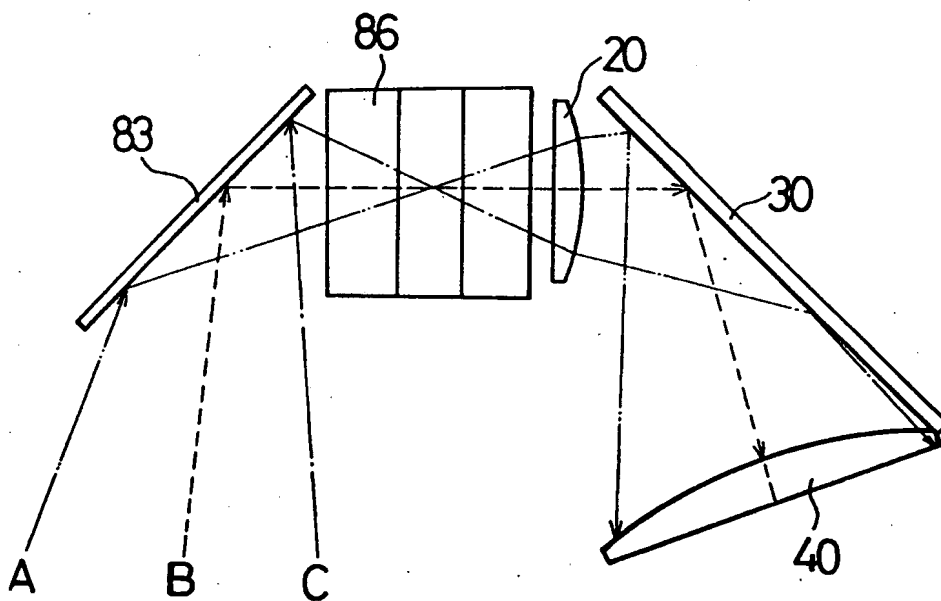
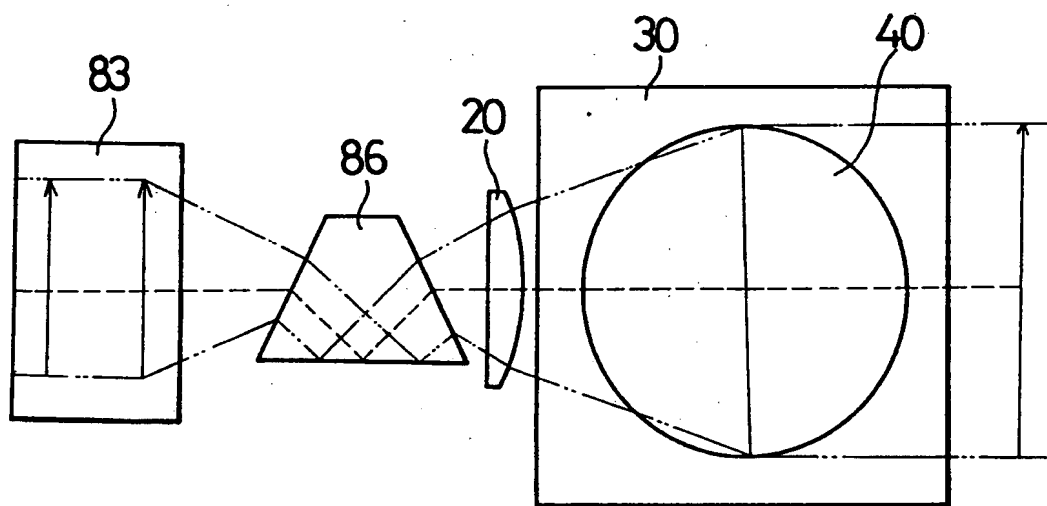


FIG 12



7/12

FIG 13

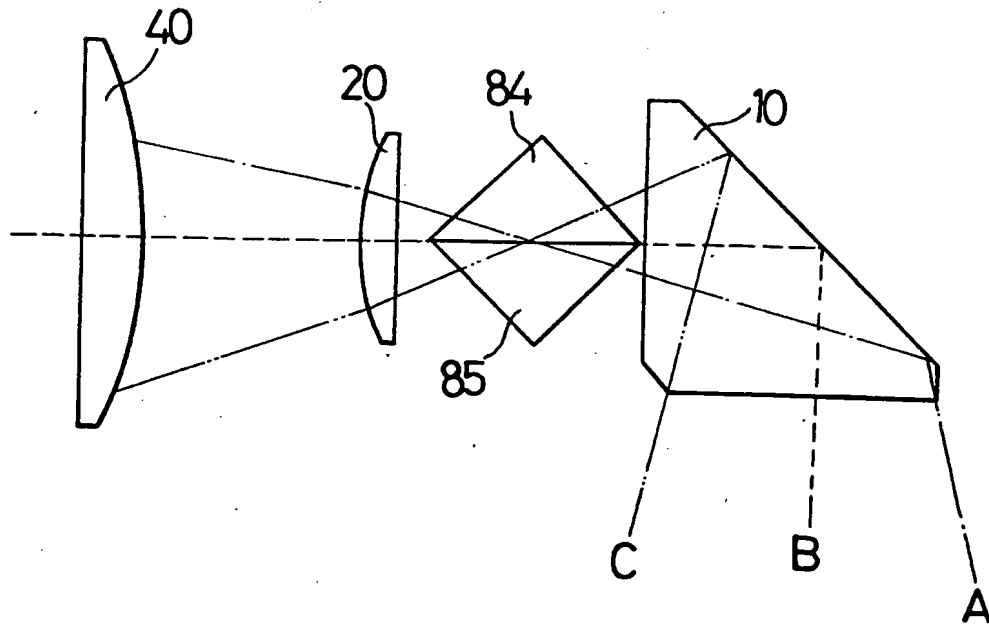
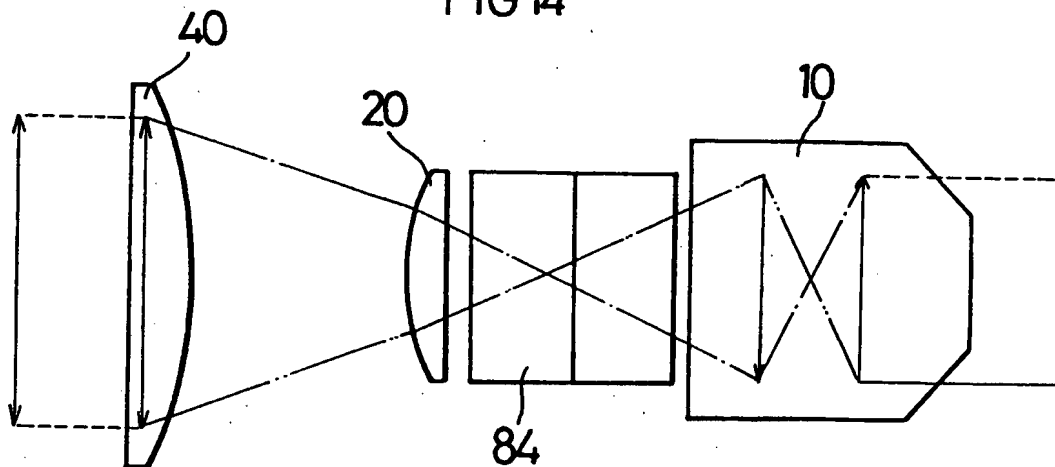


FIG 14



8/12

FIG 15

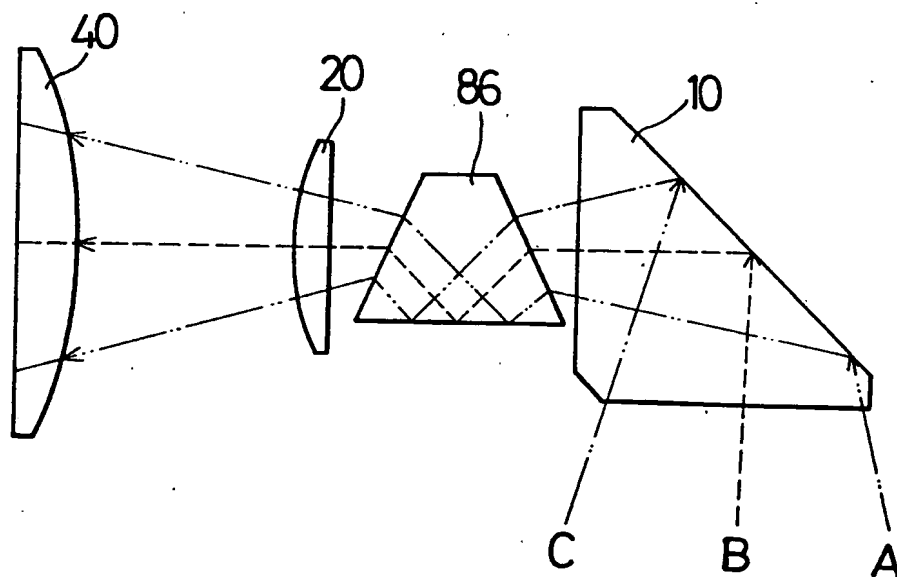
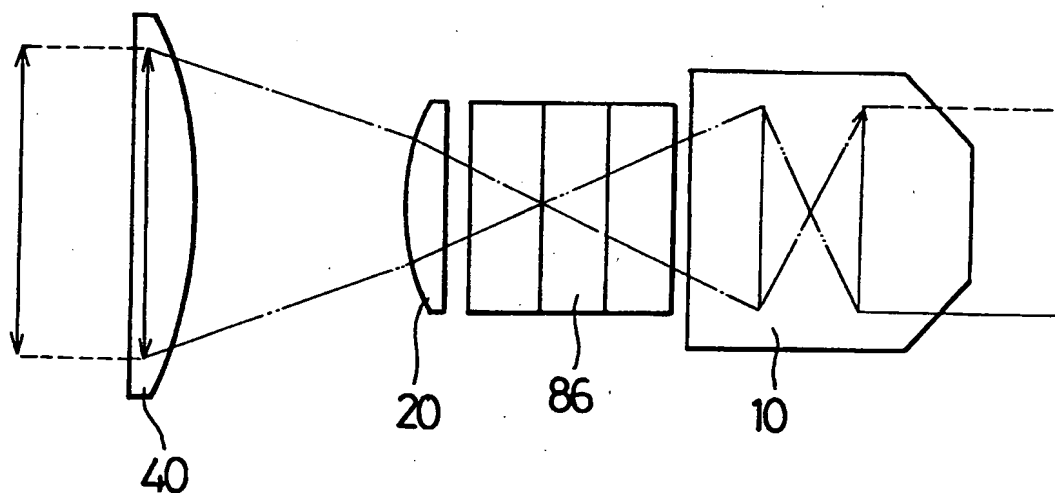


FIG 16



9/12

FIG 17

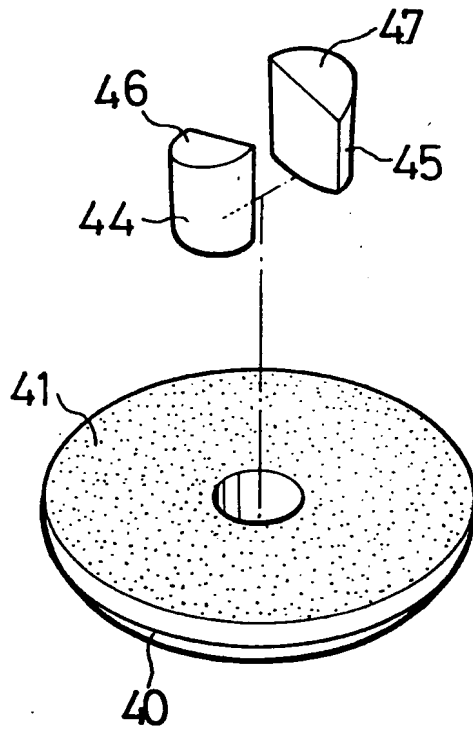


FIG 18

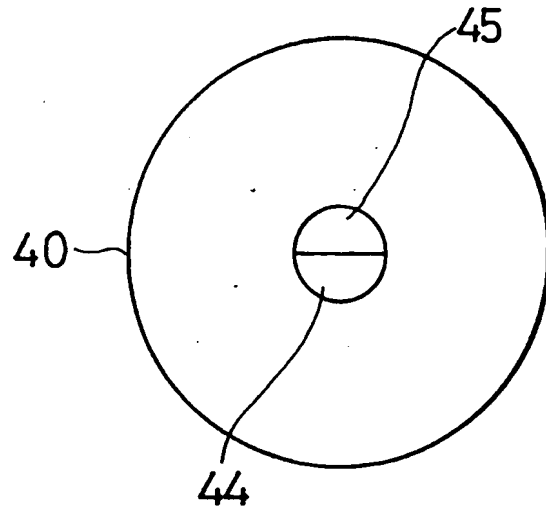


FIG 19

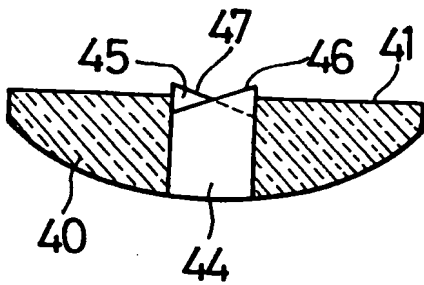


FIG 20

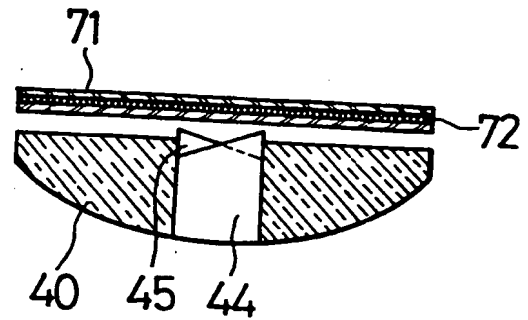


FIG 21

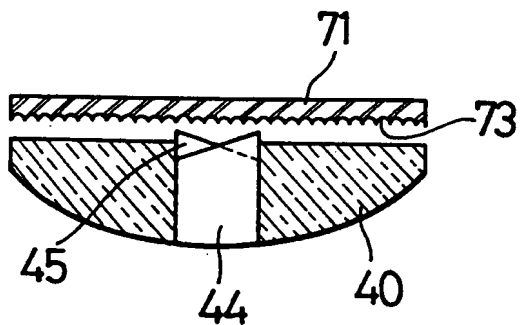
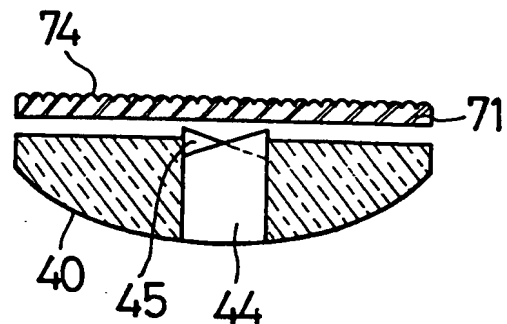


FIG 22



10/12

FIG 23

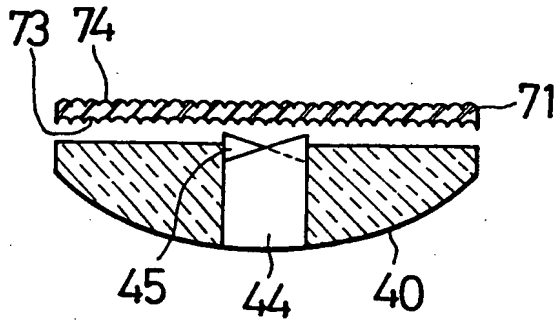


FIG 24

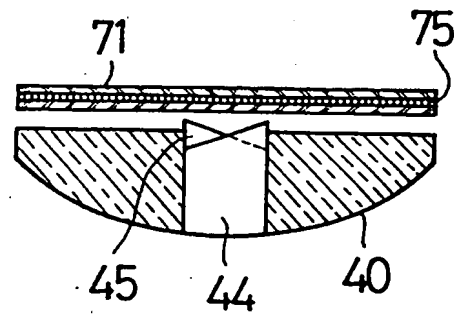
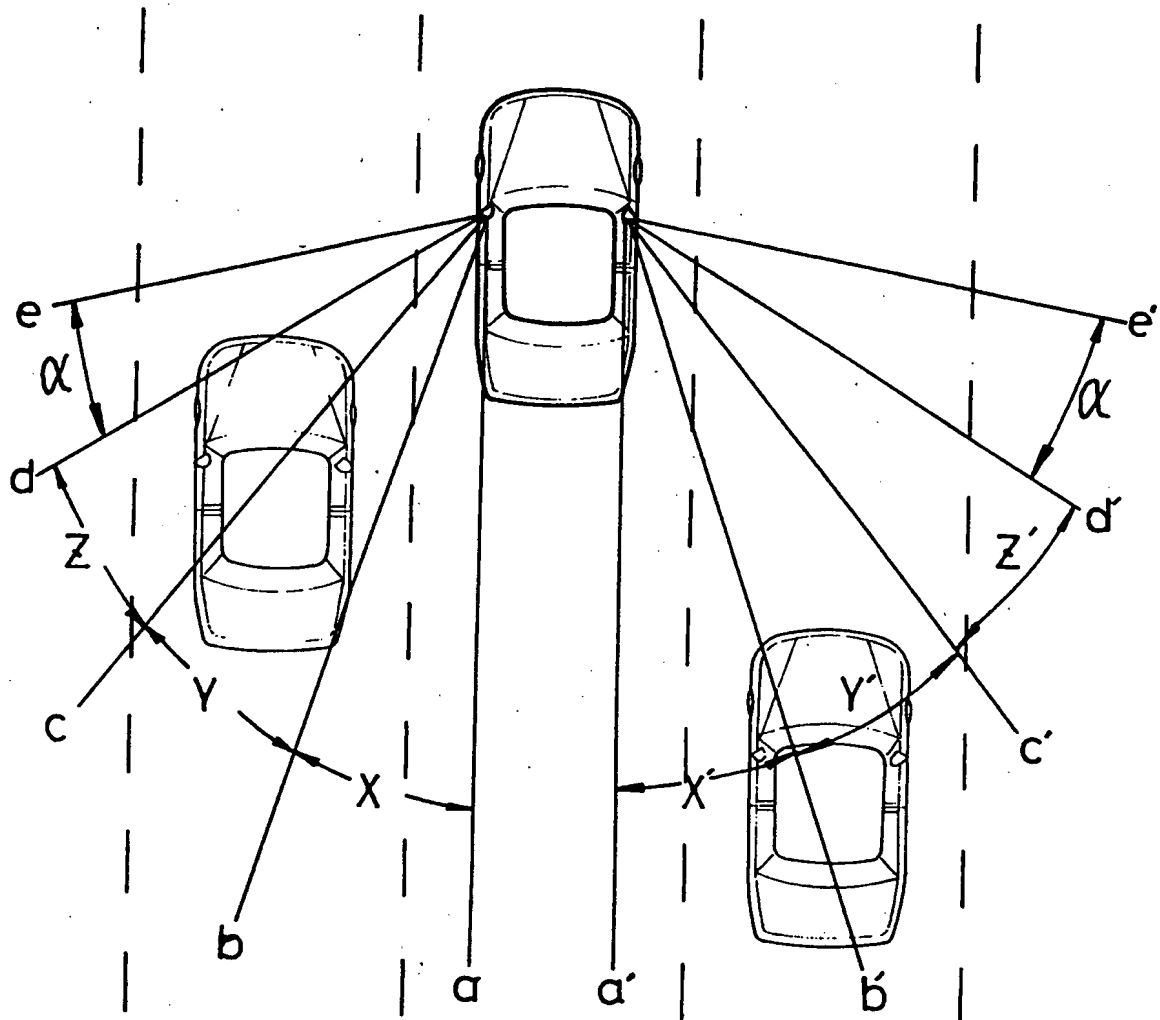


FIG 25



11/12

FIG 26

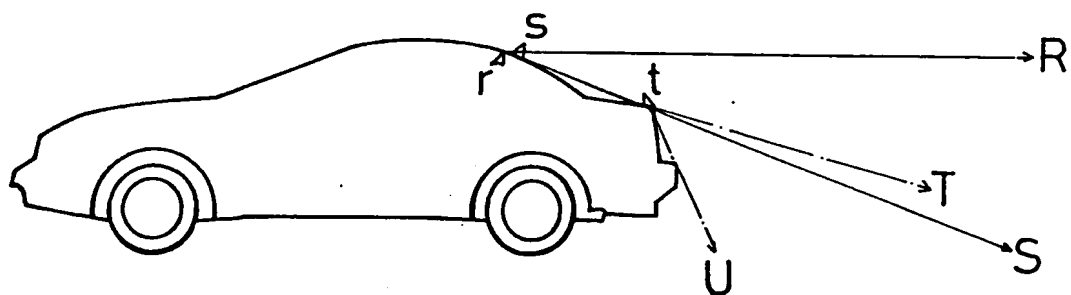
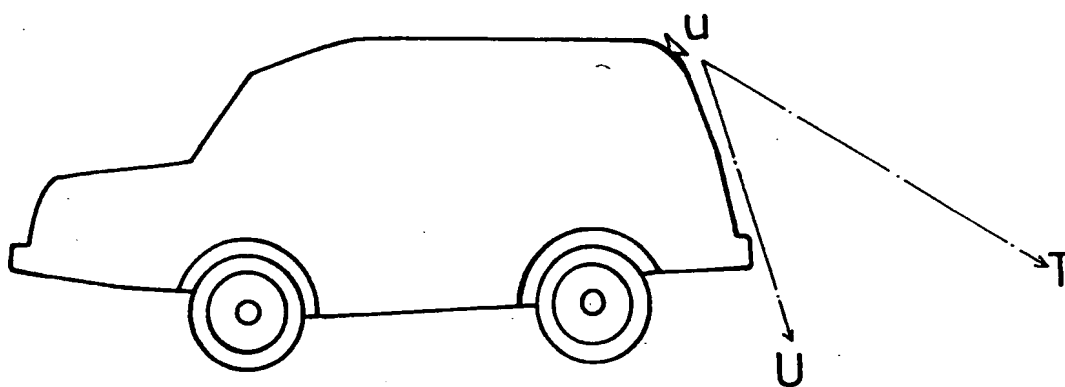
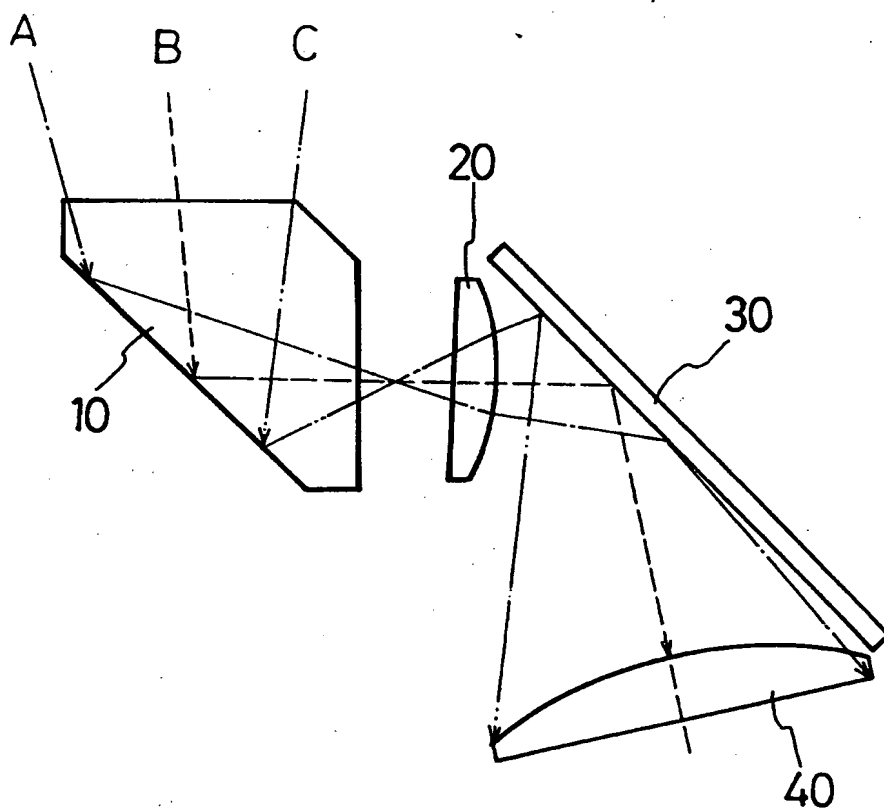


FIG27



12 / 12

FIG 28



INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR 95/00057

A. CLASSIFICATION OF SUBJECT MATTER

IPC⁶: B 60 R 1/08

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC⁶: B 60 R 1/00,1/08,1/10; G 02 B 17/00,17/02

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 19 44 298 A (HAHN) 04 March 1971 (04.03.71), totality.	1
A	FR 1 140 079 A (BERGER) 11 July 1957 (11.07.57), fig. 1-3.	1,5,14-18
A	GB 2 223 464 A (RILEY) 11 April 1990 (11.04.90), fig. 1-4.	1,13
A	GB 2 254 832 A (MILNER) 21 October 1992 (21.10.92), fig. 1-9.	1
A	US 3 979 158 A (YAMASHITA) 07 September 1976 (07.09.76), fig. 1-7.	1
A	US 3 947 095 A (MOULTRIE) 30 March 1976 (30.03.76), fig. 1-8.	1

☐ Further documents are listed in the continuation of Box C.

☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

03 August 1995 (03.08.95)

Date of mailing of the international search report

21 August 1995 (21.08.95)

Name and mailing address of the ISA/ AT
AUSTRIAN PATENT OFFICE
Kohlmarkt 8-10
A-1014 Vienna
Facsimile No. 1/53424/535

Authorized officer

Pangratz e.h.

Telephone No. 1/53424/413

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/KR 95/00057

In Recherchenbericht angeführtes Patentedokument Patent document cited in search report Document de brevet cité dans le rapport de recherche	Datum der Veröffentlichung Publication date Date de publication	Mitglied(er) der Patentfamilie Patent family member(s) Membre(s) de la famille de brevets	Datum der Veröffentlichung Publication date Date de publication
DE A 1944298	04-03-71	keine - none - rien	
FR A 1140079		keine - none - rien	
GB A 2223464		GB A0 8819786 GB A1 2223464 GB B2 2223464	21-09-88 11-04-90 19-08-92
GB A 2254832		EP A1 578717 GB A0 9107551 GB A0 9207925 GB A1 2254832 GB B2 2254832 JP T2 6506420 WO A1 9218353	19-01-94 29-05-91 27-05-92 21-10-92 04-01-95 21-07-94 29-10-92
US A 3979158	07-09-76	keine - none - rien	
US A 3947095	30-03-76	CA A1 1015991	23-08-77